

# SOIL SURVEY OF THE GREENEVILLE AREA, TENNESSEE-NORTH CAROLINA.

By CHARLES N. MOONEY and O. L. AYRS.

## LOCATION AND BOUNDARIES OF THE AREA.

The Greeneville area is located in East Tennessee, with the southeastern portion extending over the Tennessee-North Carolina line and including a portion of Madison County, N. C. The area surveyed comprises the western two-thirds of the Greeneville sheet of the United States Geological Survey.

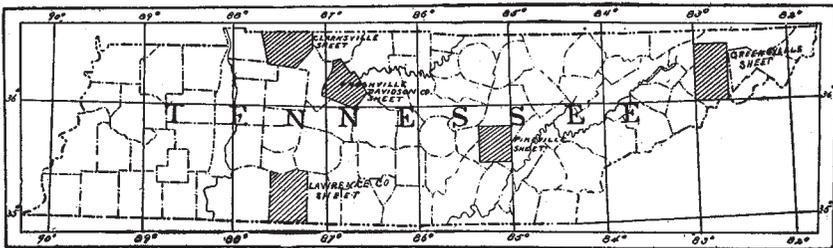


FIG. 20.—Sketch map showing location of the Greeneville area, Tennessee.

The area is bounded by the meridians of  $82^{\circ} 40'$  and  $83^{\circ}$  west longitude, and by the parallels of  $36^{\circ}$  and  $36^{\circ} 30'$  north latitude. These boundaries form a rectangular-shaped area approximately 34 miles long from north to south by 19 miles wide from east to west, comprising a total of 424,960 acres, or 664 square miles.

The counties represented in the survey are Greene, Hawkins, Sullivan, and Cocke, in Tennessee, and Madison in North Carolina, two-thirds of the area lying within Greene County and most of the remaining third in Hawkins County.

The area is in the oldest settled part of Tennessee, and since the establishment of the counties named, first as a part of North Carolina, then as the "State of Franklin," and finally in Tennessee, they have been devoted entirely to agriculture, and have been known more or less prominently as agricultural communities.

Greeneville, the largest town in the area, with a population of something over 3,000, is the county seat of Greene County, and was the capital of the temporary State of Franklin. It is now a thriving

business town. Rogersville, with a population of about 1,000, is the county seat of Hawkins County and lies just outside the area. In the early history of Tennessee it was the State capital.

#### HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Before its settlement by white people this part of Tennessee was the hunting ground of numerous Indian tribes living to the south and north. The "barrens," or treeless portions, afforded a rank growth of grasses, the feeding grounds of herds of buffalo, elk, and deer, and the canebrakes along the stream courses were a refuge for bears.

To this section about 1750 or soon thereafter came adventurous hunters from Virginia and North Carolina, seeking hunting grounds where game was plentiful and furs could be obtained. It was with these hunters that agriculture had its beginning, as when their trips extended over a season or more they grew small crops of corn.

Within a few years after the advent of the hunters settlers from Virginia and North and South Carolina began to move to the new country, where land could be bought for little or nothing from the Indians. In 1772 some Virginians settled in Carters Valley, near what is now Rogersville, in Hawkins County. Settlement was begun in Greene County in 1778, along the Nolichucky River and Lick Creek. Those who had obtained larger tracts or grants of land offered good inducements to settlers, and settlement became quite rapid, being facilitated by the building of a road across the mountains. Virginia supplied numbers of settlers, while from Pennsylvania came Quakers, Scotch-Irish, and Pennsylvania Dutch. By 1795 the population of Tennessee had increased to more than 60,000. Soon after its settlement Tennessee had been annexed to North Carolina, forming what was called Washington County. In 1783 Greene County was formed, being the third in Tennessee.

The settlers were at first engaged in the fur trade. Wild game was plentiful and furnished them with food, as well as winter clothing and furs for trade. They grew some garden vegetables. Corn was grown from the first and became the principal crop, wheat and other small grains being introduced later. The growing of corn, however, continued to hold the leading place, and by the census of 1840 Tennessee ranked first among the corn-producing States.

Hemp and flax were grown generally, but only for home consumption. Prior to the civil war considerable hemp and flax were produced in Greene and Hawkins counties, but after the war the production decreased and was finally abandoned. Cotton was grown at a later date, but never on a commercial scale. These products were all prepared at home and, with the wool obtained from the sheep raised, were woven into homespun clothing by the women.

The raising of live stock, particularly hogs, as they were easily marketed, later became an important industry. The markets in those days were Baltimore, Md., and Augusta, Ga., and roads were built to these places. The latter place being nearer and having the better route, most of the live stock and other products were taken that way, and thence by water to Baltimore or some other northern market. Later transportation was facilitated by the use of flatboats on the rivers at times of high water. These were the only means of communication until 1858, when the East Tennessee Railroad was completed and put into operation. This road became a great factor in the development of the region.

Besides the crops already mentioned, the earlier settlers grew tobacco, but only in quantities sufficient for home use. Tobacco also became a medium of exchange. It was not until about 1882 that this crop was grown on a commercial scale. At that time there was need of a money crop, and as the land would produce tobacco and the prices were such as to make its culture profitable, it was taken up generally by the planters. The tobacco grown was mostly a bright smoking tobacco, the best grading as a bright wrapper. Some Burley tobacco was also produced. The tobacco was grown on all the sandy valley lands and on the white sandy lands south of the Nolichucky River, which form the lower slopes of the Blue Ridge Mountains. Tobacco growing is now entirely confined to the latter soils. The land was cultivated continuously to tobacco and soon decreased in productiveness, while the price has fallen to a point where the crop ceases to be profitable, so that the industry has been abandoned on the valley soils.

The tobacco market for the first two or three years was at Bristol, but since 1885 it has been at Greeneville, which is the only bright tobacco market in Tennessee.

#### CLIMATE.

The following tables, compiled from the Weather Bureau records for Greeneville, Rogersville, and Newport, show the normal monthly and annual temperature and precipitation for the area, and the occurrence of the last killing frosts in spring and the first in fall. These stations are representative of the greater part of the area. Greeneville lies near its center, while Rogersville and Newport are just outside. Rogersville, in Hawkins County, may be said to represent the ridge district, while the situation of Newport corresponds with that of Greeneville.

From the appended figures it will be seen that there is very little difference in temperature and precipitation over the area. The winters are mild, but there are cold periods when the temperature

approaches zero, though these are of short duration. At Greeneville the snowfall amounts to about 15 inches annually. The area lying at considerable elevation and near the mountains the summers are temperate and, although during the day the temperature may be high, the nights are always cool. Unseasonable frosts frequently occur and make fruit growing uncertain.

The rainfall is fairly well distributed, the last four months of the year being the driest. Often the rainfalls are heavy, and early summer droughts are apparently becoming more common.

No data are available for the mountain section of the area, which covers only a small territory, and one of no agricultural value. Its climatic conditions are quite different from those of the valley, owing to its much greater altitude. The climate is much colder and the growing season shorter.

*Normal monthly and annual temperature and precipitation.*

Month.	Greeneville.		Rogersville.		Newport.	
	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January .....	36.5	3.68	35.7	3.87	38.3	3.73
February .....	39.3	4.12	38.5	4.68	39.7	4.07
March .....	46.4	5.11	46.0	5.23	47.6	5.40
April .....	56.3	3.40	58.0	3.51	56.9	3.98
May .....	64.6	4.12	64.5	3.94	65.9	4.20
June .....	72.1	4.90	71.9	3.91	74.3	4.26
July .....	74.8	4.68	74.5	4.55	76.9	4.29
August .....	73.3	4.62	73.5	4.16	75.5	4.36
September .....	68.7	2.86	68.1	2.47	69.4	2.44
October .....	56.8	2.51	56.1	2.51	57.6	1.79
November .....	46.6	2.42	46.4	2.90	46.4	2.71
December .....	39.2	2.96	38.0	3.47	38.6	3.15
Year .....	56.2	44.88	55.7	45.20	57.3	43.78

*Dates of first and last killing frosts.*

Year.	Greeneville.		Rogersville.		Newport.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
1896 .....	Apr. 7	Oct. 19	Apr. 8	Oct. 19	Apr. 5	Oct. 19
1897 .....	Apr. 18	Oct. 30	Apr. 18	Oct. 30	Apr. 18	Nov. 4
1898 .....	Apr. 8	Oct. 15	Apr. 6	Oct. 15	Apr. 8	Oct. 19
1899 .....	Apr. 17	Sept. 30	Apr. 17	Sept. 30	Apr. 17	Nov. 4
1900 .....	Apr. 13	Nov. 5	May 4	Nov. 5	Apr. 6	Nov. 8
1901 .....	Apr. 24	Oct. 15	Apr. 16	Nov. 5	Apr. 21	Nov. 6
1902 .....	Apr. 5	Oct. 15	Apr. 12	Oct. 29	Apr. 8	Nov. 29
1903 .....	Apr. 24	Oct. 25	Apr. 24	Oct. 25	Apr. 5	Oct. 25
Average .....	Apr. 15	Oct. 19	Apr. 17	Oct. 23	Apr. 11	Nov. 3

## PHYSIOGRAPHY AND GEOLOGY.

The Greeneville area covers parts of the Great Valley of East Tennessee and the Appalachian Mountains. These two sections are included in what is known as the Appalachian physiographic province, and represent two of its three main divisions, namely, the Great Appalachian Valley and the Appalachian Mountains. These divisions extend the entire length of the province, or from southern New York to central Alabama. Their trend is northeast to southwest. In the different States through which these divisions pass local names have been applied. The valley portion of the Greeneville area belongs to that portion of the Great Appalachian Valley known as the Great Valley of East Tennessee, while the mountains belonging to the Appalachian system are known along this portion of the Tennessee and North Carolina line as the Bald Mountains.

The rock formations of the entire area are of sedimentary origin—that is, they were laid down in water. These consist of sandstone, shale, and limestone, all presenting great variety in composition and appearance. The materials composing these rocks were originally gravel, sand, and mud derived from the waste of older rocks farther east, together with the remains of plants and animals.

The age of the rock formations ranges from early Cambrian to Carboniferous, but the Devonian and Carboniferous formations are small and unimportant. The Silurian furnishes the greater number and the most important.

The valley portion of the Greeneville area occupies about seven-eighths of its total extent, the greater part being included in Greene and Hawkins counties, with only small portions of Sullivan and Cocke counties.

The rock formations of the valley are sedimentary and more or less calcareous, consisting of limestone, shale, and sandstone, and comprising a great variety of each. Originally the strata must have been laid down horizontally, but by the movements that took place later they have been folded and broken, and now intersect the surface at various angles and in belts. As these rocks vary in composition and hardness, the rate of weathering has been different. The harder and more resistant rocks, like the sandstones and cherty limestones, form the ridges, while the softer and more soluble rocks, like the purer limestones and shales, form the intermediate valley floors. Thus from each kind of rock certain characteristic surface features are obtained, which may be divided into districts or belts corresponding to the underlying rock formations. These are the limestone and shale belts, which together form the valley proper and the ridge district. Each of these belts or districts forms the drainage basin of one of the principal streams of the area.

The limestone belt forms the drainage basin of the Nolichucky River. It lies on the eastern side of the valley, and its surface features consist of a series of high, rolling ridges, with narrow intervening valleys. The slopes are, as a rule, smooth and gentle, and adapted to cultivation. The ridges run with the valley and parallel to each other. At intervals they break down, and the larger streams cut through the gaps, while the smaller streams follow the valleys. The elevation of this section averages about 1,400 feet above sea level, ranging from 1,100 feet, where the Nolichucky River leaves the area, to nearly 1,800 feet on the higher cherty ridges bordering the western portion of the belt. Numerous sinkholes are also a prominent feature in the topography, and afford partial drainage.

The underlying rocks consist of a series of blue, gray, and whitish limestones and dolomites, the magnesian limestone or dolomite, known as the Knox dolomite, predominating, while in the beds are nodules and masses of black chert. Besides the chert the Knox dolomite contains only 5 to 15 per cent of earthy matter, and on account of the great solubility of its material decay is rapid and the resulting soil formation is deep, leaving a stiff red clay, over which lies the fine sandy to silty or loamy soils, with the cherty matter concentrated on and near the surface. The amount of chert varies from practically nothing to an amount so great as to make up the larger part of the surface and preclude cultivation. When weathered the cherts are white and broken into sharp, angular fragments.

Economically, the limestone formation furnishes building material, lime, and road metal. A narrow belt of the limestone in Hawkins County has been changed to a marble, which has been quarried for ornamental and building material.

The shale or "knob belt," as it is called, occurs next to the limestone belt on the west. It extends across the area in a northeast and southwest direction, and through its center Lick Creek follows a winding course. The characteristic topography of the shale formation consists of rounded knobs and irregularly shaped ridges without any arrangement, rising from 200 to 300 feet above the small, narrow valleys between. On the northern side of the belt, and as it approaches the east, the hills are not so high and the topography is more rolling. A narrow knob belt also occurs along the Holston River.

The Lick Creek Valley is wide, and extensive flood plains have been built up along it and its principal tributaries composed of the wash from the adjacent shale slopes. The sediment forms a heavier soil than that in the limestone formation, it being strong and fertile and agriculturally one of the most important soils in Greene County.

The elevation of the knob belt varies from 1,100 feet, where

Lick Creek leaves the area, to 1,500 feet above sea level on the highest knobs.

The underlying rock formations consist of shales, varying from argillaceous to sandy, thick to thin bedded, and more or less calcareous. The shales, being soft rocks, weather rapidly, but erosion is active and the resulting soil formation is shallow. The complete weathering of the shale produces a stiff, plastic, yellow clay loam or clay, through which are scattered varying amounts of more or less decomposed shale fragments.

The ridge district occupies the northwestern part of the area. It is characterized by a number of long, narrow, parallel ridges or mountains, separated by narrow valleys.

The rock formations of this section are sandstone, shale, and limestone, all occurring in narrow, alternating belts. The ridges are composed of red and white sandstone, the white forming the top layer. This stone is very resistant to weathering, which condition results in narrow, sharp ridges, with the upper slopes, especially on the southeastern side, forming cliffs; while below these there is a short talus slope, the débris covering the shales. Usually the slopes are very stony, though some parts of the ridges, where the beds are not tilted at such an angle, weather more uniformly, forming rounded tops or knobs, with gentle slopes, and to these has been applied the term "comby ridges." The elevation of these ridges is about 2,000 feet, with some higher points culminating in a sharp peak—Chimney Top—at an elevation of 3,076 feet above sea level, and the highest point in the valley. South of the Holston River shales and shaly limestones form the valley floors, their surfaces being gently rolling to moderately hilly. North of the Holston the valleys were formed from limestone with narrow belts of shale. These valleys, too, are gently rolling. The narrow strip of shales may be traced by the series of knobs characteristic of the shale formations.

The elevation of these valleys averages about 800 feet lower than the ridges, or about 1,200 to 1,300 feet above sea level.

The drainage of this section is into the Holston River. The largest tributaries are Beech Creek on the south and Big Creek on the north. The ridges are broken down in a few places, and these creeks flow through the gaps thus formed. Both creeks are strong and rapidly flowing streams.

The Bald Mountains extend across the southeastern portion of the area, not occupying more than one-eighth of the total area surveyed. This section is characterized by a main ridge trending from northeast to southwest, with an elevation of about 4,400 feet, culminating in Camp Creek Bald, with an elevation of 4,760 feet above sea level, and the highest point within the area. From the main ridge numerous sharp spurs extend out on both sides at right angles. These are only

a few hundred feet lower than the main ridge, and are rough, stony, and practically inaccessible. The main ridge has in part a broad, rolling top, but the slopes are steep, being either sheer precipices, hundreds of feet high, or steep, stony, talus slopes. Lower down, on the western side, at about the 2,000-foot contour, the slope becomes gentle and extends out from 2 to 4 miles toward the Nolichucky River. Over much of the gentle talus slope are scattered rounded, water-worn boulders of sandstone, in many cases sufficient in number to prevent cultivation, while in other places they are entirely lacking, the slopes having evidently been old sand bars.

The rock formations of the Bald Mountain section consist of sandstones varying from fine to coarse and moderately coarse conglomerates, and quartzites. Shaly sandstones and sandy shales are also present. Disintegration has been the force breaking down these formations, and as the sandstone is quite resistant, weathering has been slow, leaving steep-sided mountains. The resulting soil from these rocks is a yellowish or sometimes reddish sand, with but little organic matter and low productiveness.

Small, rapid mountain streams drain this section. Hickey Fork and Paint Creek are the principal streams on the east, while numerous creeks drain the western slope and empty into the Nolichucky River.

#### SOILS.

The rock formations of the Greeneville area afford a great variety of soils. In all, ten types have been classified and shown on the accompanying map. The basis of classification has been mainly one of textural difference, as shown in the field, but has taken into account also the derivation and agricultural value. The soils, with the exception of two types, are of residual origin; that is, derived from the underlying rock in place. The soil types have been correlated when possible with similar soils of East Tennessee and Alabama, which had been established and described previously to the survey. The name and actual and relative extent of each soil type are given in the following table:

*Areas of different soils.*

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb stony loam .....	99,072	23.3	Meadow .....	17,216	4.0
Fort Payne loam .....	83,520	19.7	Dekalb silt loam .....	10,560	2.5
Dekalb shale loam .....	64,896	15.3	Fort Payne clay loam .....	9,536	2.2
Fort Payne stony loam .....	64,386	15.1	Cumberland loam .....	7,040	1.7
Fort Payne clay .....	47,168	11.1	Total .....	424,962	-----
Decatur clay .....	21,568	5.1			

## FORT PAYNE LOAM.

The soil of the Fort Payne loam consists of a fine to medium slightly sandy loam, varying from a gray to yellowish or brown color. In general the type is a medium, slightly sandy loam, but in some situations the texture becomes finer, being almost a silty loam. The depth of the soil varies from 8 to 18 inches, but the average depth for the whole area is probably about 12 inches.

The subsoil consists of a yellowish-red clay loam, grading generally in a few inches into stiff clay, which at lower depths becomes a deep-red color. The clay loam, however, often extends to greater depths or in many cases is not present, the soil resting upon the stiff red clay. Usually some small cherty fragments are present in the soil, but not to exceed 10 per cent, nor enough to give the soil a too gravelly character.

The Fort Payne loam is one of the most extensive soil types of the Greeneville area. The principal development is in Greene County, in the limestone part of the valley proper, where the soil occurs in a large area or broad belt extending along both banks of the Nolichucky River. This belt enters the area at the extreme southwestern corner and extends northeast out of the area. There are, however, within the belt small areas of other soils. Some small areas of Fort Payne loam also occur in the limestone belt north of the Holston River, as well as associated with the Fort Payne stony loam, to which soil it is closely related.

The Fort Payne loam occupies the high, rolling ridges and the intermediate valleys. The ridges run in general parallel to each other, and to the valley formations. They are from 100 to 200 feet higher than the valleys. The slopes are, as a rule, gentle enough to permit cultivation, yet on the steeper grades washing is pronounced and cultivation is interfered with.

Because of the rolling character of the Fort Payne loam, the surface drainage is good. Many streams head in the formation, the smaller ones generally following the valleys, while the larger ones cut across the formations. Drainage into sinkholes is also a prominent feature of this soil. Having a clay subsoil, with a more sandy covering to act as a mulch, the soil is retentive of moisture, and is therefore not so droughty as some other of the valley soils.

The Fort Payne loam is a residual soil, and is derived from a limestone formation known geologically as the "Knox dolomite." This formation consists of a series of blue, gray, and whitish limestones and dolomites, the dolomite, however, being the most important in the soil formation. The process of weathering has been mostly a chemical one—that is, the solution of the rock in rain water charged with carbon dioxide. These rocks are highly soluble, containing only 5 to 15 per cent of insoluble matter. The decay is rapid and has gone

to a considerable depth. Rock outcrops are seen in only a few places in stream cuts. Portions of the type, however, have small quantities of small cherty fragments which were present in the parent rock and have been left from its decay. The amount, though, is not enough to influence the type materially. Where the cherty fragments do occur in sufficient quantity to influence the character of the soil such areas have been mapped as the Fort Payne stony loam.

The underlying rock is more or less siliceous, and the result of weathering has been the formation of stiff clay, upon which has been concentrated the fine siliceous matter forming the more sandy covering, or soil.

The productiveness of the Fort Payne loam varies greatly over the area. In general it has been cropped continuously and poorly farmed, with the result that its productive power has decreased. Wheat yields on an average about 8 bushels to the acre, although much higher yields are reported. On some of the better farms it will produce as much as 20 to 25 bushels, such yields being secured on the more loamy and heavier phases of the type. In general it is not regarded so highly for wheat as the soils derived from the shales. Corn does fairly well, and seems to be a surer crop than wheat, producing from 20 to 40 bushels per acre, especially on the lower slopes in the small valleys, where there is a greater accumulation of soil. Oats are grown, but not in great quantities, and are fed to the stock in the sheaf. Small quantities of rye are grown. Clovers and grasses do fairly well, particularly upon the improved lands. In some sections on the larger farms large areas are in grasses and used for pasturage. The soil is naturally a little too loose for grasses, but is made more compact by the trampling of the stock. It is considered a good practice to have land trampled by stock, particularly before sowing to wheat. There is much of the land that should be kept in pasture, particularly the steeper slopes, where washing occurs. Formerly considerable quantities of bright tobacco were grown on this type, and some is still grown nearer the mountains, where the sandy covering is deeper.

Commercial fertilizers are used generally on all crops, and are found necessary in order to get even ordinary yields, especially in the case of wheat. The amount of live stock on farms is small, so that little barnyard manure is available. Systematic crop rotations are not generally followed. The land is cultivated chiefly to wheat and corn, with an occasional interval in clover or grass. When the slopes become washed and the land becomes too poor to cultivate the fields are abandoned, and are soon covered by a growth of broom-sedge.

The Fort Payne loam is susceptible of improvement. Having a good subsoil and a loose soil it is easily cultivated, is retentive of moisture and fertilizers, and responds readily to good cultural methods. With a suitable crop rotation and the use of green manuring crops and lime, and with good cultivation, conditions would be greatly improved. Fruit would probably prove successful on this soil. The forest growth consists of oak and chestnut.

The value of the Fort Payne loam varies from \$10 to \$40 an acre, averaging from \$15 to \$20.

The following table shows the results of mechanical analyses of the fine earth of typical samples of this soil:

*Mechanical analyses of Fort Payne loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
11146	½ mile W. of Buckingham Ford.	Gray loam, 0 to 12 inches.	0.7	3.3	3.9	10.8	12.8	49.8	18.7
11148	3 miles S.W. of Greeneville.	Clay loam, 0 to 10 inches.	.3	1.4	9.6	19.6	5.4	24.9	38.7
11149	Subsoil of 11148 .....	Clay, 10 to 36 inches .....	.1	1.2	4.7	9.2	3.7	14.8	65.7
11147	Subsoil of 11146 .....	Clay, 12 to 36 inches .....	.0	.7	.8	2.6	2.7	21.5	71.0

FORT PAYNE STONY LOAM.

The soil of the Fort Payne stony loam, to an average depth of 10 inches, varies from a gray to light-yellow or light-brown fine sandy to silty loam, underlain by a yellowish-red clay loam, which soon grades into a stiff, tenacious clay, becoming redder in lower depths. The subsoil is also more or less mottled with white, particularly in the higher lying areas. The color and fineness of the soil give it an ashy appearance and feel. It is sometimes spoken of as "white land."

In the soil and upon the surface are found angular chert fragments, usually small, and varying from 10 per cent of the soil to quantities so large that there is very little soil, the whole being a mass of chert fragments of no value for any crop.

The subsoil, as a rule, is free from these fragments, or has them only in the first few inches. Rock outcrops are also a prominent feature of this type, and, in fact, some areas consist of little else than projecting masses of rock in place.

The Fort Payne stony loam is a valley soil, and is associated with the Fort Payne loam, of which it may be considered the stony phase. Its principal development is in Greene County, along the Fort Payne loam, occurring between the latter and the shale formation as an irregularly shaped belt. Small patches are scattered throughout the area of the Fort Payne loam. A small, continuous strip occupies Big Ridge from Midway to Albany, and another occurs to the north of the Holston River, following a series of high ridges.

The physiographic features of this formation consist of high, broad, rounded ridges, the soils occupying the top, slopes, and intermediate valleys, while in the small areas occurring in the Fort Payne loam they occupy the upper slopes of the ridges, generally those exposed to the east. The ridges are quite marked, rising from 200 to 500 feet above the intermediate valleys. Because of the presence of the chert and rock outcrops, soil washing is, in a large measure, prevented, although in less stony areas washing is pronounced.

From its position and stony character good natural drainage is assured. On the higher situations the water drains off so rapidly that crops suffer for lack of moisture. Sinkholes are numerous, and a prominent factor in the drainage. Some streams head in the formation, although springs are not numerous.

The Fort Payne stony loam is of residual origin, being derived from the weathering of a magnesian limestone or dolomite containing cherty nodules. By the solution of the limestone the cherty nodules remaining are concentrated on and near the surface, so that the resulting soil is stony. The chert, originally black, weathers out white. The size of the fragments varies, but they are usually 1 or 2 inches in diameter and of angular shape. The land of this type is not generally desirable for cultivation, and is mainly left in forest, consisting of chestnut and oak. On the exceedingly stony areas cedar is the principal growth. Some wheat is grown, but the yields are small, as are also those of corn. Areas where rock outcrops do not occupy too much space and where the soil is heavier do well in grass. Bluegrass thrives, and, aside from forestry, pasturage is the use for the type.

On some of the higher ridges peaches have done well, but the orchards are in poor condition at present, and the value of the type as a fruit land can not be definitely stated, although it does seem that with proper methods fruit growing could be made profitable on these lands if climatic conditions were at all favorable.

The value of the Fort Payne stony loam does not exceed \$10 an acre.

The following table shows the mechanical analyses of typical samples of the fine-earth portion of this soil:

*Mechanical analyses of Fort Payne stony loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
11158	1 mile N. of Mosheim.	Silty loam, 0 to 10 inches.	1.3	1.8	1.2	2.3	5.1	68.3	19.7
11160	1 mile N. of Surgoinsville.	Clay loam, 0 to 12 inches.	1.2	1.4	1.3	2.9	9.7	57.2	26.4
11159	Subsoil of 11158 .....	Clay, 10 to 36 inches .....	.4	.6	.3	.8	2.3	36.5	59.1
11161	Subsoil of 11160 .....	Clay, 12 to 36 inches .....	.0	.2	.2	.6	3.0	29.0	66.9

The following sample contains more than one-half of 1 per cent of calcium carbonate (CaCO<sub>3</sub>): No. 11159, 0.79 per cent.

## DECATUR CLAY.

The soil of the Decatur clay, to an average depth of 10 inches, varies from a dark reddish-brown loam to a heavy dark loam or clay loam grading into stiff, tenacious, intensely red clay, which extends to great depths.

The largest area of the Decatur clay occurs in the northwestern part of the sheet, occupying the Carter and Stanley valleys in Hawkins County. Numerous small areas occur in Greene County, scattered through the Fort Payne loam and the Fort Payne stony loam. The largest of these areas is that known as the "Horse Creek section," which occupies both banks of the Nolichucky River in the vicinity of Horse Creek. The areas occurring with the Fort Payne stony loam are long and narrow, and in these some rock outcrops are found.

There is one phase of the type occurring as a long narrow strip about one-fourth of a mile wide between the shale and limestone formations in the Stanley Valley, situated in the northwestern corner of the sheet in Hawkins County. In this small area outcrops of the underlying rock, which is a marble, are a prominent feature and occur to such an extent that one-half or even more of the surface is occupied by them. These outcrops appear at the surface as rounded, partly buried boulders, or in long ledges. Between them the soil is deep and fertile. The marble, which is a metamorphosed limestone, weathers like limestone, the process being one of solution in rain water. This weathering, however, has been unequal, as the marble varies greatly in composition. The softer and more soluble parts

have been removed, and the small insoluble residue has formed the soil, while the harder and more insoluble parts have resisted weathering and appear as outcrops. This phase of the type occupies the top and western slope of one of the valley ridges, and a high value is placed upon the land because of the underlying marble, some of which has been quarried in the past.

In the valley proper the areas of the Decatur clay are nearly level to gently rolling, though some of the areas occur on slopes originally occupied by the Fort Payne loam, where this soil has been removed, exposing the subsoil, which, with plowing and the wash from higher slopes, has become loamy. The topography of the Carter and Stanley valleys is gently rolling, and it is in these that the most typical development of the soil is found. Near the mountain slopes the soil is more or less influenced by the sandstone débris of the mountains. The gently rolling character of most of the areas insures good natural drainage, but on the more level situations drainage is assisted by drainage furrows.

The Decatur clay is a residual limestone soil, derived from the weathering of massive limestones. The weathering has resulted in the almost complete decomposition of the underlying rocks, the great depth of the soil formation being shown by cuts and by the rare occurrence of rock outcrops, excepting in a certain phase of the type in one small area heretofore described.

The Decatur clay is recognized as the strongest soil in the area, and is highly esteemed for general farming. Wheat will yield from 10 to 25 bushels to the acre, and even larger yields are reported. The average yield is about 12 bushels. Corn does well, particularly on the lower situations, where the soil is lighter and deeper. The yields range from 25 to 50 bushels per acre. The type is regarded as good clover and grass land, and large quantities of clover and timothy hay are produced. A large acreage is also devoted to pasturage, as live stock, particularly cattle and mules, form an important interest on farms located on this type. Much of this land produces bluegrass.

Farms on the Decatur clay have an appearance of prosperity. They are all fairly well fenced, and improved with good dwellings and barns and other outbuildings. The value of these farms is higher than that of any other of the upland valley soils. The price varies from \$15 to \$50 an acre, the average being about \$25 or \$30, depending upon the extent of improvements. The farms on this type generally contain about 200 acres each.

The following table gives the mechanical analyses of the soil and subsoil of this type:

*Mechanical analyses of Decatur clay.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to	Silt, 0.05 to 0.005	Clay, 0.005 to 0 mm.
			mm.	mm.	0.25 mm.	mm.	0.05 mm.	mm.	mm.
11140	5 miles S. of Greeneville.	Red heavy loam, 0 to 10 inches.	P. ct. 1.7	P. ct. 4.2	P. ct. 4.3	P. ct. 9.6	P. ct. 12.2	P. ct. 44.6	P. ct. 23.4
11168	1½ miles SW. of Gillenwater.	Reddish-brown heavy loam, 0 to 8 inches.	3.7	4.1	4.1	7.8	9.5	44.5	26.7
11138	1½ miles SW. of Bleivins.	Brown clay loam, 0 to 12 inches.	1.2	3.2	2.4	4.7	8.1	50.1	30.3
11142	1 mile E. of Greeneville.	Brown heavy clay loam, 0 to 10 inches.	1.1	2.8	2.5	4.1	5.2	47.5	36.8
11141	Subsoil of 11140 .....	Red clay, 10 to 36 inches	.7	2.7	2.8	6.1	7.6	38.4	41.9
11139	Subsoil of 11138 .....	Red clay, 12 to 36 inches	.5	2.6	1.8	4.2	7.6	38.3	44.8
11169	Subsoil of 11168 .....	Red clay, 8 to 36 inches	.3	.8	1.0	3.2	6.5	30.0	58.4
11143	Subsoil of 11142 .....	Dark red clay, 10 to 36 inches.	.4	1.1	.8	1.6	2.9	17.3	75.8

The following sample contains more than one-half of 1 per cent of calcium carbonate (CaCO<sub>3</sub>): No. 11168, 1.24 per cent.

## DEKALB SHALE LOAM.

The soil of the Dekalb shale loam varies from a brown to a yellowish clay loam or clay, having an average depth of 8 inches. The subsoil consists of a heavy yellow clay loam, increasing in clay content with depth until, in the more level situations, it becomes a stiff plastic clay.

Upon the surface and throughout the soil and subsoil are scattered shale fragments, which increase with depth, the subsoil resting upon the broken underlying shale. In some locations, and particularly upon steep slopes, where the soil is removed nearly as fast as made, the formation is little more than a mass of more or less weathered broken shale.

The Dekalb shale loam has an extensive development in this region. Its principal area occurs as a broad belt extending along Lick Creek from near the western boundary northeast entirely across the area. The belt is broadest between Greeneville and Romeo, where it has a width of 8 miles, and gradually narrows until where it leaves the area it is only one-half mile wide. The southern boundary of this belt is irregular, owing to the intermingling of the shale and limestone formations. Extending from Midway to Albany is a high limestone ridge breaking into the Dekalb shale loam area. Some long, narrow belts of the Dekalb shale loam occur in Greene County, mingled with the limestone formations. Three small areas also occur in Hawkins County.

The surface features are those characteristic of shale formations, consisting of a series of rounded hills or knobs without any arrangement, of uniform elevation, with steep sides but smooth contours. Between the hills are narrow, winding valleys, occupied, as a rule, only at wet periods by small streams. Only along Lick Creek and its larger tributaries have the bottoms become wide enough so that flood plains could be developed.

The section occupied by the shale formation is known locally as the "knob belt," because of its characteristic surface features. The long, narrow areas are also marked by a series of broad, rounded knobs, which appear conspicuously contrasted to the limestone formations.

The broken nature of the underlying rock and the steepness of the slopes afford rapid removal of water from the surface soil and subsoil. In fact, the drainage is too rapid, as the soil soon becomes dry, and droughty conditions prevail. The drainage of the principal area is into Lick Creek and its tributaries. These, as a rule, are sluggish streams, and quite deep.

The Dekalb shale loam is a residual soil, derived from the weathering of the underlying shales. These vary from argillaceous to sandy and thin to thick bedded, and all are more or less calcareous. During the uplifts and subsidences to which the valley formations were subjected, the shale formations were turned up on end and greatly distorted and shattered. The process of weathering has been carried on by both physical and chemical forces and has extended to considerable depth. The rocks weather to a yellowish color and the soil formation is shallow. The surface features produced are such as to bring about the removal of much of the weathered product or soil as soon as formed. When there is a chance for accumulation the complete weathering results in a heavy yellow clay.

The principal crops to which this soil is adapted are wheat and grasses. The upland areas are devoted entirely to these crops, while corn is grown on the lower slopes and the narrow bottoms of the valleys. Wheat averages from 8 to 10 bushels per acre, although in favorable seasons much larger crops are obtained. To obtain these yields commercial fertilizers are used, usually at the rate of from 100 to 150 pounds per acre. The fertilizers used are generally the cheap acid-phosphate brands. Without the use of fertilizers, which serve to start the crop, good stands can not be obtained with the present condition of the soil. The wheat, however, is of superior quality.

The grasses grow well when care is given to the working of the land, but much of this land has been farmed so carelessly and allowed to wash so badly that it is difficult to get a good stand. Timothy is produced, and also clover. The hay is almost all baled

and sold. After a crop or two has been removed the fields are pastured. It is reported that for the last few seasons it has been difficult to get a good stand of grass. It starts well, but when a dry season comes in midsummer it is burned out.

Corn does not do well because of the heavy texture and shallowness of the soil and its tendency to droughtiness. As corn does not do well on the uplands, a rotation with a cultivated crop can not well be followed. It is carried out by some, however, the corn being followed by wheat for two years, and then by grass for hay, finally pasturing a few years. The soil seeds to bluegrass naturally, and is therefore adapted to grazing.

Conditions on this type could be greatly improved if more live stock were kept and the manure put back on the land. The soil is retentive of fertilizers. Lime has proved beneficial, but very little is used. The physical condition could be greatly improved by the use of green manuring crops.

The farmers on the "slate lands," as the Dekalb shale loam is called, are fairly prosperous. The farms are all well fenced, and good dwellings and outbuildings are seen. The farms, as a rule, are large, and are valued at from \$10 to \$30 an acre, the average price lying between \$15 and \$20.

The following table gives the results of mechanical analyses of the fine earth of typical samples of this soil:

*Mechanical analyses of Dekalb shale loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.		Coarse sand, 1 to 0.5 mm.		Medium sand, 0.5 to 0.25 mm.		Fine sand, 0.25 to 0.1 mm.		Very fine sand, 0.1 to 0.05 mm.		Silt, 0.05 to 0.005 mm.		Clay, 0.005 to 0 mm.	
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.			
11156	4 miles NW. of Greenville.	Brown clay loam, 0 to 8 inches.	10.4	10.5	4.1	5.7	5.8	34.7	28.6							
11154	1½ miles E. of Mosheim.	Brown clay, 0 to 7 inches.	.4	1.8	1.9	2.6	2.1	38.5	52.1							
11155	Subsoil of 11154 .....	Yellow clay, 7 to 18 inches.	4.3	7.3	3.7	6.2	6.2	27.5	44.5							
11157	Subsoil of 11156 .....	Clay, 8 to 18 inches .....	1.7	2.5	1.5	3.1	6.5	30.5	54.2							

The following sample contains more than one-half of 1 per cent of calcium carbonate (CaCO<sub>3</sub>): No. 11155, 0.90 per cent.

#### FORT PAYNE CLAY.

The soil of the Fort Payne clay, to a depth of 7 inches, consists of a clay, which when moist is sticky and of a brownish color, but when dry becomes gray or slate colored. The subsoil is a yellow clay,

which quickly changes with depth to a stiff, plastic yellow clay having a greasy feel. The depth rarely exceeds 20 inches, the material resting upon the weathered and more or less broken underlying rock.

On the steep slopes the soil has been removed or partly removed by erosion, and the subsoil is exposed. Small shaly fragments, of varying quantity and more or less decomposed, are found upon the surface and in the soil and subsoil, and where erosion has been active, as on the slopes, the soil formation consists of the decomposed fragments, which form a plastic clay, retaining the structure of the rock from which derived. Upon plowing land in this condition it breaks into little blocks and becomes cloddy. The subsoil exposed in washes and cuts has a greenish-yellow color, and checks in blocks upon drying. The soil also shrinks into blocks upon drying, and large cracks are formed. Besides the smaller fragments a prominent feature is the slabby pieces of shale and shaly limestone scattered over the surface, the quantity, however, rarely being sufficient to affect cultivation materially. Outcrops of the underlying rocks occur on the eroded slopes and the tops of ridges.

The Fort Payne clay occurs as long, narrow areas in the ridge district of the valley section, the greatest development being in the strips bordering and immediately south of Bays Mountains and along the Holston River. Most of these strips are continuous, varying some in width, and extend across the area in a northeast to southwest direction, continuing on out of the area. The type occupies the narrow intermediate valleys as well as the lower slopes of the mountains. Some of these valleys, or portions of them, are gently rolling to moderately hilly. Nearer the mountains, or on what might be termed the "lower slopes," the formation is hilly or knobby. The area along the Holston River is extremely rough, consisting of rounded knobs and irregularly shaped ridges which rise rather steeply from 200 to 300 feet above the valleys between them.

The drainage of the Fort Payne clay is mostly effected from the surface, as the subsoil is more or less impervious, although there is some underdrainage through the broken underlying rocks.

The Fort Payne clay is derived from the weathering of shales varying from sandy to thick-bedded calcareous shale and shaly limestone. The formation occurs with the sandstone, the more sandy shales lying next to the sandstone, the effect of which is shown in the soil. The process of weathering has been carried on both by physical and chemical forces, the broken fragments decaying in place to form the soil. These rock formations stand vertical or nearly so, but the resulting soil is shallow, being constantly reduced by erosion. Often the rock is exposed or is close to the surface. In the degradation of these for-

mations slabby pieces a foot or more long and an inch or more in thickness, representing the less soluble parts have been left on the surface.

In a small area, less than 2 square miles in extent, in the extreme northwestern corner of the survey in Hawkins County, there is a noticeable variation in this type of soil. Outcrops of shaly and massive limestones occur, and slabby fragments of the former are found strewn on the surface, while the outcrops of the latter are so prominent in some localities as to leave little land for cultivation. These outcrops appear most commonly in long, parallel ledges. Where the limestone has entered into the soil formation, the subsoil has become reddish, and red clay is found beneath. This phase of the Fort Payne clay, owing to its hilly and steep topography, its droughty nature, and the outcropping of the rock or its nearness to the surface, is used almost exclusively for pasturage. Bluegrass grows upon it and affords good pasturage, except in times of drought.

The Fort Payne clay is known locally as "Redbud land," a name which in this part of Tennessee is generally applied to heavy soils on which redbud grows. This is the heaviest soil of the Greeneville area. The land is said to hold water—that is, the subsoil is always moist, yet in dry times plants suffer from lack of moisture, the close texture retarding its passage to the growing plants. When wet the soil is exceedingly sticky and intractable, and upon drying it bakes hard and cracks. When worked wet clods are formed, which are difficult to reduce; hence it is necessary that the land should be worked when in proper condition to insure good tilth and to obtain the best results.

The Fort Payne clay is considered one of the strongest and most productive soils of the area. It is best adapted to those crops which do best on a heavy soil, and can withstand drought or be harvested before the summer season is far advanced. These comprise the grain crops and grasses. Of the cereals, wheat does best, yielding on an average from 10 to 15 bushels to the acre. These yields are often exceeded, however, and should be if the land is well prepared. The more level or gently rolling to moderately hilly lands are generally desired, and these farms in the small valleys, such as the Butcher Valley, are noted for their productiveness. The extremely hilly lands, though too steep for grain farming, do fairly well for pasturage, as bluegrass grows upon them naturally. Nearly all the land of this type is cleared and devoted to either grain or grass. Clover also thrives upon this soil, but for the last few years it has been difficult to get good stands because of the unfavorable seasons. Long droughts in summer have burned the clover and grasses out, or else unfavorable

weather has retarded the growth of the plants, so that the stand was not strong enough to go through the summer. On the lower slopes, where the soil is deeper and more loamy, good corn crops are produced and also excellent crops of timothy hay.

This soil is retentive of manures and is much improved by the use of barnyard manure and green manuring crops. Lime is also beneficial in improving the structure of the soil.

The conditions on this soil are similar to those on the Dekalb shale loam. The value of the land is about the same, or possibly a little higher.

The following table gives the results of mechanical analyses of the fine earth of typical samples of this soil:

*Mechanical analyses of Fort Payne clay.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.		Coarse sand, 1 to 0.5 mm.		Medium sand, 0.5 to 0.25 mm.		Fine sand, 0.25 to 0.1 mm.		Very fine sand, 0.1 to 0.06 mm.		Silt, 0.06 to 0.005 mm.		Clay, 0.005 to 0 mm.	
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.				
11162	1½ miles N. of Gillenwater.	Brown clay loam, 0 to 8 inches.	0.8	1.9	1.0	2.2	14.2	47.1	32.9							
11150	¼ mile S. of Strahl...	Brown clay, 0 to 8 inches.	1.3	3.8	2.6	3.2	1.7	38.3	49.1							
11152	2 miles W. of Baileyton.	Brown clay, 0 to 7 inches.	1.0	2.1	1.2	2.6	2.0	33.0	58.2							
11163	Subsoil of 11162 .....	Clay loam to clay, 8 to 20 inches.	1.3	3.8	1.7	2.5	16.5	44.4	30.0							
11151	Subsoil of 11150 .....	Yellow clay, 8 to 24 inches.	.7	3.3	2.6	4.4	2.6	30.9	55.2							
11153	Subsoil of 11152 .....	Yellow clay, 7 to 16 inches.	.3	1.5	1.1	1.7	1.0	31.7	62.7							

The following samples contain more than one-half of 1 per cent of calcium carbonate (CaCO<sub>3</sub>): No. 11152, 0.7 per cent; No. 11153, 6.5 per cent; No. 11151, 5.7 per cent.

FORT PAYNE CLAY LOAM.

The Fort Payne clay loam, to an average depth of 10 inches, consists of a compact loam to almost silty loam. It has an ashy appearance and feel, and the color ranges from gray to light yellow. The subsoil is a heavy yellow clay loam, grading quickly into stiff, sticky, impervious yellow clay, which in the lower depths is often mottled with red. The depth of soil and subsoil usually exceeds 36 inches, but in places shaly material is found near the surface. The subsoil is of an impervious nature, being so close that the movement of moisture is retarded, with the result that in dry times the soil is very droughty and crops suffer greatly. For this reason the type is not generally desired as farming land.

The Fort Payne clay loam occurs in two areas in Greene County. The principal one is found between Caney Branch and Cedar Creek, where it has the greatest development, coming into the area below Siremburg and extending northeast, crossing the Nolichucky River, and finally ending at Richland Creek. The other area, which is probably a disconnected part of the one described, occupies the hills to the west of the town of Chucky.

The type occupies high hilly to gently rolling lands. The hills resemble those of the shale formations, but have longer and gentler slopes. The impervious character of the subsoil does not admit of underdrainage, so that the greater part of the rainfall runs off the surface. On the more level uplands swampy conditions prevail to some extent.

The Fort Payne clay loam is a residual soil, derived from the weathering of a series of rocks consisting of sandy to argillaceous calcareous shales, shaly limestones, and impure limestones. The more sandy product occupies the surface, while the clay forms the subsoil. The weathered shale is found in road and stream cuts, and the subsoil often retains the structure of the original rock until disturbed. Upon the surface, and especially on the lower slopes, are found rounded "niggerheads" of cherty material. These, however, do not occur in sufficient quantity, except in a few small areas, to interfere with cultivation.

This land is not generally desirable, and though much of it has been cleared a large part is still in forest. The cleared portions afford some pasturage. Wheat produces from 6 to 10 bushels per acre. The type is not suited to corn at all, except on the lower situations. If seasons are favorable good stands of grass can be obtained. The land is difficult to work, and it is said to be necessary to break it while in a moist condition, for the material, though containing some coarse sand, works like an extremely heavy soil. When wet it puddles, and when dry it becomes very hard and breaks up into lumps. The roads are clayey, and when wet are very slippery, travel being impossible when they are very wet.

The value of land composed of this type of soil as a rule does not exceed \$10 an acre.

The table following gives the results of mechanical analyses of the fine earth of typical samples of this soil.

*Mechanical analyses of Fort Payne clay loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			mm.	mm.	0.25 mm.	mm.	0.05 mm.		
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
11124	2 miles SE. of Caney-branch.	Loam, 0 to 10 inches.....	6.7	5.3	2.8	6.5	9.1	52.7	16.8
11122	5 miles S. of Greenville.	Loam, 0 to 8 inches.....	4.9	5.2	2.6	5.5	9.7	53.0	19.1
11123	Subsoil of 11122.....	Mottled clay, 8 to 36 inches.	.2	.5	.5	2.2	4.7	40.3	51.8
11125	Subsoil of 11124.....	Clay, 10 to 36 inches.....	2.4	2.5	1.3	3.0	4.2	28.1	58.5

## CUMBERLAND LOAM.

The soil of the Cumberland loam consists of a gray, slightly sandy loam, averaging 10 inches in depth, somewhat silty in texture, and having an ashy appearance and feel. The texture, however, varies. In some localities the sand particles become coarser and there is less silt present. The subsoil is a yellow, slightly sandy loam of similar texture to the soil, but somewhat more compact, sometimes becoming a little heavier in lower depths. The depth of the subsoil generally exceeds 36 inches, but sometimes it is less, the underlying shale coming to within 24 inches of the surface, in which case the lower part of the subsoil becomes clayey from the shale. Rounded, waterworn gravel are found on the surface in some areas, and sometimes beds of gravel occur in the formation. In general, however, the type is free from stones. It is locally known as "white land."

The Cumberland loam is found along the Holston River, occurring as a second terrace, which is either level or slopes gently toward the river. It is a sedimentary soil formation, laid down by the Holston River at some earlier stage in its development. It is deposited over a shale formation, which outcrops in road cuts and is sometimes but little below the surface.

The Cumberland loam is considered a "thin" soil, and hence is not generally cultivated, not being so desirable as the adjoining areas of heavier soils and first bottoms. It is largely left in forest, forming the wooded portion of the farms along the river, and valued for its supply of firewood and lumber. It is a leachy soil, and can not be readily improved, but does well for garden vegetables. It produces a good quality of bright tobacco, but at present no tobacco is grown, mainly because of the ruling low prices.

These lands are generally a part of bottom farms, and no particular value is placed upon them.

The following table gives the results of mechanical analyses of the soil and subsoil of this type:

*Mechanical analyses of Cumberland loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to 0.25	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to 0.05	Silt, 0.05 to 0.005	Clay, 0.005 to 0
			mm.	mm.	mm.	mm.	mm.	mm.	mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
11164	1 mile S. of Spears...	Slightly sandy loam, 0 to 10 inches.	1.0	4.9	5.3	17.8	17.8	44.5	8.7
11166	½ mile E. of Chissolms Ford.	Slightly sandy loam, 0 to 12 inches.	.4	2.0	2.2	13.2	24.9	48.3	8.7
11165	Subsoil of 11164 .....	Slightly sandy loam, 10 to 30 inches.	1.2	5.9	5.5	17.9	16.8	39.9	12.5
11167	Subsoil of 11166 .....	Yellow loam, 12 to 36 inches.	.2	1.4	1.4	9.9	20.4	48.6	17.7

DEKALB SILT LOAM.

The Dekalb silt loam, to an average depth of 10 inches, consists of a gray to light-yellowish compact loam, or clay loam, which is quite silty. It has an ashy appearance and feel. The subsoil is a yellow silty clay, commonly mottled with white in the lower depths. This rests usually upon a yellow clay, which in turn grades into shale. Generally this clay foundation is reached at depths greater than 36 inches, but in some places it rises to within 20 inches of the surface. Broken, thin-bedded, sandy shales are also found near the surface on the slopes and tops of knolls.

The type occurs as a narrow strip between the Dekalb shale loam and the Fort Payne clay, extending across the area in a northeasterly direction, and nowhere exceeding a width of a little over a mile, the widest part being between Romeo and Baileyton. It occupies nearly level to gently rolling lands, and has become known locally as "flat-woods," the greater part of it being forested with oaks.

The type is probably of residual origin, being derived chiefly from very fine sandy shales. These shales are found exposed in road cuts, but fragments seldom occur upon the surface or in the soil, the degradation of the rock being complete. There is a possibility, however, of its being a sedimentary soil, in the form of an old terrace, or that it is a wash from the mountains together with material derived from shale formations.

The position of the Dekalb silt loam does not insure good surface drainage, as much of it is quite level, and as underdrainage is prevented by the impervious character of the clay found beneath, the type is cold and wet and works like a heavy soil.

The land of this soil is considered "thin," but it is said to be easily

improved. It is retentive of fertilizers, and is greatly improved by the use of barnyard manure and green manuring crops. It can, therefore, be made to give fair yields. Wheat and grass are the principal crops. The former does not exceed 8 bushels per acre, as a rule, though larger yields are occasionally obtained. The grain, however, is of good quality. The type does fairly well in grass.

The following table gives the results of mechanical analyses of typical samples of this soil:

*Mechanical analyses of Dekalb silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			mm.	mm.	0.25 mm.	mm.	0.05 mm.	mm.	mm.
11120	1 mile E. of Bailey- ton.	Silty loam, 0 to 10 inches.	P. ct. 0.4	P. ct. 0.8	P. ct. 0.9	P. ct. 2.3	P. ct. 9.5	P. ct. 62.2	P. ct. 23.7
11118	1½ miles E. of Romeo.	Clay loam, 0 to 8 inches ..	.5	1.7	.8	1.4	2.6	65.0	28.1
11121	Subsoil of 11120 .....	Clay, 10 to 36 inches .....	.3	.5	.6	1.4	6.9	53.1	37.2
11119	Subsoil of 11118 .....	Clay, 8 to 36 inches .....	.2	.5	.2	.7	2.6	55.3	40.4

DEKALB STONY LOAM.

The Dekalb stony loam is a mountain type of soil and the only one occurring on the mountains in the Greenville area. The soil consists of a gray to yellowish medium to coarse sandy loam, with an average depth of 8 inches. The subsoil is a yellow sandy loam rarely exceeding a depth of 20 inches, and at that depth resting upon a mass of broken sandstone, or, as on lower talus slopes near streams, on rounded, waterworn sandstone boulders. Upon the surface and throughout the soil and subsoil occur angular and subangular sandstone rocks, their character and quantity varying in different locations. The greater number of loose boulders is found on the lower slopes, as on the long talus slopes of the Bald Mountains toward the Nolichucky River. Here the quantity is often sufficient to preclude cultivation. However, there are areas with only a small proportion of rock fragments present. Such areas occur on the long talus slopes mentioned above, and represent the fine material or sand which has been washed out of the sandstone formation. Other less stony areas occur on the top and lower slopes of Bays Mountain, in the ridge district of the valley, where the rock is somewhat different and has weathered more uniformly. In places where the red sandstone has entered into the soil formation the type varies in color and to some extent in texture, being brown or red and a little finer, while the rock fragments are small and not quite so numerous. The area, however, of this variation from the general type is small.

The Dekalb stony loam is one of the extensive soil types of the Greenville area. It is found developed principally in two sections of the area, occurring in both physiographic divisions. One of the areas is large and continuous, and is situated in the extreme southeastern part of the sheet, covering the Bald Mountains; the other development is the principal feature of the ridge district in the valley, occurring as a long, narrow area occupying the tops and upper slopes of the ridges and mountains of that section.

As the Dekalb stony loam covers the mountains, its surface features are those of the tops and slopes of these mountains. As a rule the tops are narrow and stony. One exception is the main ridge of the Bald Mountains, a part of which has a broad rolling top, with a soil somewhat loamier than the general type. This part is known as the "Beech Bottoms," from the beech growth there. Another exception occurs in the ridge district, in which the rocks have weathered in a series of broad, rounded domes occurring at regular intervals, and to these has been applied the name of "comby ridges."

The upper slopes, as a rule, are abrupt, often consisting of high, precipitous cliffs or very steep slopes with outcrops of rock, or with large boulders scattered thickly over the surface. Lower down the talus slopes become less steep, but still have large quantities of stones. The largest talus slope is that of the Bald Mountain, and is the most important part of this type agriculturally.

Because of its topographic position, its sandy and stony character, and the underlying mass of broken rock, the drainage of this soil is rapid and thorough.

As has probably been inferred from the preceding description, the Dekalb stony loam is a residual soil. It has been derived from the disintegration of a variety of sandstone rocks, which consist of sandstones varying from fine to coarse to moderately coarse conglomerates, and to quartzite and sandy shales. These are all more resistant to weathering than any of the other rock formations of the region, and hence form the higher parts of the area and the mountain cliffs. The boulders and rock fragments are angular to subangular, except on the lower talus slopes, where the fragments have been waterworn and rounded.

The greater part of the Dekalb stony loam is of no agricultural value. The tops and slopes of the Bald Mountains and some parts of the mountains in the ridge district are inaccessible, besides being too steep and stony for cultivation. The soil, in general, affords only a light forest growth, consisting of oak, chestnut, and some pine, and even this is of no value because of its inaccessibility. In some of the ravines, where the soil is richer, heavier growths are found, consisting of pine, hemlock, and hardwoods, and where accessible these are of value. The value of the mountain lands depends almost entirely upon

the forest growth, though they are also of some value as a range for cattle and sheep.

The lands that are capable of cultivation are not very productive. The texture of the soil makes it leachy, and it can not be permanently enriched or brought to a much higher state of cultivation. The lower gentle talus slopes are cultivated, the principal crop and the money crop on this type being tobacco. This is a bright yellow tobacco used for smoking and chewing, and is generally put up in the form of a twist. The better grade is used as plug or twist wrappers. It is a strong tobacco, and its quality can not be considered the best. Yields are generally about 500 to 600 pounds to the acre, though larger yields are sometimes obtained. Commercial fertilizers are used in all cases. A medium quantity brings about the best results. The quality of the tobacco grown on the richer soils is not considered so good as when grown on the thinner soils with the use of fertilizers. The tobacco is flue cured and sold on the Greeneville market. The prices obtained are low, making the growing of tobacco almost unprofitable, so that the growers are decreasing the acreage, and many are abandoning it entirely. The type is not well adapted to farm crops. Of the cereals, rye does the best, but the yields are small. Corn gives low yields and does better on the stony parts that can be cultivated, because of better moisture and temperature conditions. Vegetables and small fruits do well. The soil is adapted to peach culture, particularly on the slopes, but the market facilities are not such as to warrant the extensive growing of the fruit, unless it should be for drying or canning.

The following table gives the results of mechanical analyses of typical samples of the fine earth portion of this soil:

*Mechanical analyses of Dekalb stony loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			mm.	mm.	0.25 mm.	mm.	0.05 mm.		
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
11126	Blairsgap .....	Medium to fine sandy loam, 0 to 8 inches.	0.2	3.1	18.6	50.9	10.5	11.7	5.0
11134	5 miles E. of Whig ..	Coarse sandy loam, 0 to 8 inches.	4.1	16.6	12.9	20.2	7.5	24.2	14.1
11128	2 miles W. of Gillenwater.	Brown sandy loam, 0 to 8 inches.	1.7	6.5	6.1	13.7	13.5	42.7	15.7
11127	Subsoil of 11126 .....	Brown sandy loam, 8 to 20 inches.	.5	2.8	16.2	48.4	12.4	14.7	4.9
11135	Subsoil of 11134 .....	Coarse sandy loam, 8 to 20 inches.	5.0	16.2	11.6	18.8	7.7	23.2	17.6
11129	Subsoil of 11128 .....	Yellow loam, 8 to 20 inches.	.6	4.7	6.0	13.0	13.9	38.2	23.6

## MEADOW.

The term Meadow is applied to all lands occurring as first bottoms along the larger stream courses. These bottoms are flood plains built up by the streams at times of high water by the deposition of the earthy materials carried in suspension; and as the sources of the material vary the soils are in consequence a heterogeneous mixture, being derived from the wash of slopes adjacent to the place of deposition, and also from material brought down by the flood from sources upstream. These soils vary from sandy to silty loams or loams to silty clay loams. The lands are all subject to annual overflow, and are wet during a large part of the year.

The Meadow lands occur in two principal phases in this area, depending upon the source of the material, the texture varying accordingly. One phase occurs in the stream bottoms in the limestone areas and the other along the streams flowing through the shale formation. The first phase is not very extensive, as the streams in the limestone formations are still cutting their channels and not building flood plains. Narrow bottoms occur along the Nolichucky and Holston rivers and their larger tributaries. Areas along small streams were too small to show on a map of the scale used.

The soil of this phase varies from a brown sandy loam to a loam or silty loam about 10 inches in depth, underlain by the same material, but more compact and possibly somewhat heavier, to a depth of several feet. These bottoms have been greatly damaged in the last few years by freshets, which carry down great quantities of sand and gravel and deposit them over the surface, often ruining the land for farming purposes. These freshets are increasing in severity as the forests are removed, and especially in the mountains, where the water now rushes off the cleared slopes, where formerly the forest growth held it in check. Where these bottoms are so situated that they are not damaged by the freshets they are desirable lands, and attain a value of \$100 an acre.

The principal crop grown is corn, which produces on an average 50 to 60 bushels an acre, though cases are not rare where 100 bushels have been obtained. Large crops of timothy can be obtained, but this is not so certain a crop as corn, as it is damaged by the deposits. Wheat grows too rank and is injured by freshets.

The other phase of the Meadow occurs along Lick Creek and its tributaries. Lick Creek follows a winding course through the shale formation, and wide flood plains have been built up by it, and also along its tributaries. These are all deep, sluggish streams. Lick Creek flows nearly across the central portion of the area, and bottoms extend along its whole length, while outside the area, on its lower course, these bottoms become still more extensive and form the most important agricultural section of Greene County. The sediment

forming these bottoms is the wash from the surrounding shale lands. The soil of this phase, to an average depth of 10 inches, varies from a dark-brown heavy silt loam to a silty clay loam, underlain in the first instance by the same material, somewhat more silty and compact and of a lighter color, this being underlain by a heavy silty clay loam, which in its lower depths grades into a yellow, plastic, impervious clay. This phase is locally known as "gumbo land," and occurs back from the streams in lower situations. Unlike the bottoms along the Nolichucky and Holston rivers, deposits of sand are here desirable, because of their beneficial influence in improving the texture of the soil.

The Lick Creek bottoms are too heavy-textured for corn, yet fair yields can be obtained. They prove much better adapted to the smaller grains and grasses, and particularly to the latter. Large yields of wheat are obtained, but wheat is apt to lodge. Timothy, at present prices, is the best crop, and the one to which the greater portion of the bottoms is devoted. It yields 2 tons or more of hay to the acre. Greene County has long ranked as one of the leading hay counties of the State, and it is on these bottoms that the large quantities of hay have been obtained in the past.

These bottoms, being wide and flat, are more or less wet, and when other crops than grasses are to be grown drainage is essential. This is generally done at present by ditches and open furrows. However, some of the bottoms are underdrained by tiles, and their use will no doubt increase. On the extensive bottoms below and outside of the limits of the survey drain tiles are in general use.

As stated before, the Lick Creek bottom lands are the most important agriculturally in the area, and the owners are prosperous. These lands have the highest assessed value of any in the area, the valuation being about \$75 an acre. When sold farms bring \$100 or more an acre.

#### AGRICULTURAL CONDITIONS.

The area included in the survey, as already stated, is a part of the earliest settled portion of Tennessee, and the lands suitable for cultivation have been cultivated for a long time. General farming has been followed since the earliest times, with corn and wheat as the principal crops. These crops have been grown continuously, with the result that some of the lighter valley soils have decreased in productiveness. To such an extent has this gone that fertilizers are now considered necessary for all crops. Many old fields are to be seen, thrown out of cultivation because of unproductiveness. These are gullied by washing and covered by a growth of broom-sedge instead of bluegrass which naturally spreads over limestone soils in this part of the United States.

While Tennessee was the leading corn-producing State of the Union, and for some time after corn and wheat were profitable crops, and the raising of live stock was also an important industry, land values were rising, and the farmers are said to have been prosperous; but in more recent times the production of corn and wheat has not been so profitable, with the lower prices and the decreased productivity of the soils; while with the fall in the price of beef the raising of live stock has declined somewhat. As a consequence the farmers have not been so prosperous, and land values have decreased.

The agricultural interests are confined to general farming, with need of a ready and profitable money crop. The area affords a variety of soils, of wide adaptation and varying productiveness, and conditions over the area vary accordingly. On the Lick Creek bottoms and the "red limestone soil," or Decatur clay, the greatest degree of prosperity is shown. The former is considered the most important section of Greene County and also of the area. The Lick Creek bottoms, or Meadow lands, are the highest in value in the county. The farmers are prosperous and wealthy. They invariably make large crops and all raise more or less live stock. They have good and even pretentious dwellings, with large barns and outbuildings, while the farms are fenced and in many cases underdrained by tiles.

The Decatur clay ranks next in importance to the Lick Creek section. Owners of farms on this type of soil are likewise prosperous. They, too, have good dwellings, barns, outbuildings, and fences. Good yields of the cereal and grass crops are obtained, and a considerable amount of live stock is kept.

The extremely cherty limestone soils are not desired and are of little value. They are left in forest, consisting of oak and chestnut, or where farmed at all it is by the poorer classes.

The sandy limestone soil (Fort Payne loam) shows the effects of continuous cropping in the appearance of the fields and growing crops. The fields are not receiving the care they should and many of the slopes are washing. With but few exceptions no improvements are being made. The houses are small and plain. The barns are small and often mere sheds, and provision is not generally made for housing live stock, except the horses. It is claimed, however, that the appearance of the farms does not indicate entirely the financial standing of the owners, as many are said to be well to do. Then, too, many of the farms are rented, which accounts in great measure for the lack of improvements.

There is a large extent of shale or "slate" soils in the area, and on these are the wheat farms, wheat being the main crop, and one to which these soils are well adapted.

The mountain soils are thin, and generally too steep and stony to cultivate. They are mostly forested, and the value of the land is very low. The people living on them manage to make a living, however, their money crop being bright tobacco.

According to the Twelfth Census, of the total number of farms in Greene and Hawkins counties two-thirds are operated by the owners. The renting is chiefly on the share basis. The better farms are managed by the owners, who hire the necessary help. There are quite a number of large farms in the area, but according to the authority just quoted the average size of farms for the two counties named is 85 acres.

Labor is both white and colored. The laborers generally prefer to work the land on shares rather than by the day. The negro population is small.

Corn and wheat are the principal field crops of the Greeneville area, corn being the leading crop. In Hawkins County the acreage in corn in 1899, according to the Twelfth Census, was 41,630 acres, which is equal to that of all the other crops combined. The acreage in wheat was one-half that in corn. In Greene County there were 50,000 acres in corn, with an acreage of wheat only a few thousand acres less.

The large extent of shale soils in Greene County accounts for the large acreage of wheat. Oats are also grown, and the acreage is increasing. In Hawkins County the acreage of oats, according to the Twelfth Census, was about one-third that of wheat, while in Greene County the proportion is only about one-eighth.

The grasses and clover are also important crops. Of the grasses cut for hay timothy leads. It is the principal crop on the Lick Creek bottoms, and large yields are obtained. With the prices received for hay this crop is remunerative. Clover succeeds on most of the soils when the season is favorable. It also is cut for hay. The millets and Hungarian grasses are also grown and are gaining in favor. Great difficulty has been experienced in the last few seasons to get stands of grasses and clover, the climatic conditions having been unfavorable. Blue grass seeds naturally in all the limestone and shale soils, and is the pasturage depended upon for live stock.

The need for a money crop has always existed. Tobacco was taken up in the eighties, and its cultivation became general. For a few years the crop proved quite profitable; but at the low prices of the last few years tobacco can not be produced with much profit.

It is still an important crop, although its production is decreasing, and is now restricted to the white soils of the mountains and the talus slopes. A much better grade is grown on these higher soils than on the limestone soils. The latter, however, produce Burley tobacco

of fair quality, though very little is being grown at present. The production of tobacco in Greene County in 1899, according to the Twelfth Census, was 517,150 pounds, and in Hawkins County, 60,050 pounds. The amount was much less than had been raised formerly, and the amount now is probably still less than in 1899. The product is chiefly a bright yellow tobacco, although some Burley is produced. The former is used in the manufacture of granulated smoking tobacco and chewing tobacco. The better leaves grade as light plug wrappers. There are in Greeneville several tobacco factories which manufacture the tobacco for the market. Commercial fertilizers are necessary to grow a crop. The amount used is generally 200 or 300 pounds to the acre, with an average yield of probably 500 to 600 pounds of tobacco. The tobacco is flue cured.

All the tobacco from this section and western North Carolina is sold in open auction at Greeneville. The buyers are the local manufacturing companies, as well as representatives of the larger tobacco companies. The amount sold at present is about 1,000,000 pounds annually, but as much as 3,000,000 pounds in one year has been handled through this market.

Some sorghum cane is grown, but the product is consumed at home. Both sweet and Irish potatoes are grown, but only for home use. A relatively small quantity of broom corn is being raised. An effort is being made to increase the acreage of this crop, and it should prove a profitable one. Already a broom factory is in operation, which at present has the material shipped in, but is planning to use home-grown material in the near future.

The adaptability of a number of the soils to fruits is unquestioned. Good fruit has been grown, but not on a commercial scale. On similar soils in Virginia fruit culture has succeeded. Peaches do well on the Dekalb stony loam, and the tops and slopes of the mountains in the northwestern part of the area would be desirable locations. With the poor roads, long haul, and lack of good railroad facilities, however, this crop would hardly pay unless the product should be canned. The cherty hills of the valley would also produce good peaches. Of the fruits, apples would probably succeed the best and be most profitable. Aside from the inadequate shipping facilities, the chief drawback to fruit culture in this section is the occurrence of unseasonable frosts; but it is claimed that even if a full crop were obtained only every third year apples would still pay better than the field crops on some of the soils.

Small fruits would no doubt succeed on the sandy soils, but they would have to find a market outside the area.

As a general rule no systematic crop rotation is followed, except by a few of the better class of farmers. The rotation with them consists

of corn, followed by wheat, and then by clover or grass, which, after a couple of crops of hay, is left as pasture. Usually corn and wheat follow each other, with several crops of corn before a wheat crop is taken. On the shale or "slate" lands corn hardly enters into the rotation at all, as the soils are not adapted to its growth. On these soils grass or clover follows the wheat, of which two or more crops are taken before the soil is seeded to grass. It would be much better if a systematic and well-adapted crop rotation were followed on all soils. The use of leguminous and green manuring crops would do much to improve all the soils. No particular efforts are made to make and save the barnyard manure for use on the fields. On the other hand, the use of commercial fertilizers is general and is increasing. Fertilizer is used generally with wheat at seeding time to help it start, and on the poorer soils with corn. Lime has a beneficial effect on all the soils, but it is used hardly at all, though it can be obtained easily.

Improved farm implements are used, but their introduction is of recent date.

The transportation facilities of the area are fair. The Southern Railway crosses the area, giving direct connections to the north and south. A branch line from Bulls Gap, just a few miles outside the area, runs to Rogersville, affording an outlet for the northwestern part of the area.

Throughout the area the country roads are poor and are not kept up as they should be. The roads are of clay and during the summer season become hard and smooth and excellent for travel. During the winter, however, when they become wet and deeply rutted they are almost impassable. The roads could be easily improved, for there is plenty of road metal to be obtained from the limestone deposits. Within the area there is less than 2 miles of macadamized roads. The matter of good roads is being agitated, however, and no doubt better ones will soon be built. They would assist materially in improving the conditions of the area as a whole. Many of the roads should be reestablished, taking advantage of the topography. As they are now many of them go over hills that could be avoided.

The local markets for products are limited. As stated before, Greeneville is the bright tobacco market for east Tennessee and western North Carolina. For a market for any special product recourse must be had to shipping, and northern cities offer the best markets. At the present time the shipment of poultry and eggs from East Tennessee is quite large and is an important source of revenue to the farmers. The railroad offers good facilities for shipment, running special express trains weekly to northern cities for that purpose. With markets opened up the demands are greater, and prices are now probably double what they were formerly.

One of the natural advantages of the area is the water power afforded by its numerous streams, of which use is made to run the many grist and saw mills. The people have the advantage of a complete system of rural free delivery of mail, every community being reached by the service. Rural telephone service is also being rapidly extended. The educational advantages in the area are good. One of the oldest educational institutions in the State is still in existence in Greene County.

The water supply is plentiful, owing to the great number of springs scattered over the area. These are largely limestone, except those of the mountains, which are freestone, more or less impregnated with iron.

Its proximity to the mountains and the generally healthful climate makes the area a desirable place to live, and there are many summer resorts, which are well patronized.

# Accessibility Statement

---

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at [ServiceDesk-FTC@ftc.usda.gov](mailto:ServiceDesk-FTC@ftc.usda.gov). For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.